

April 7, 1987

CD-87-04 (LDV)

Dear Manufacturer:

Subject: CAFE Adjustment Coefficient for 1987 Model Year  
Passenger Automobiles

This letter is notification that the passenger automobile Corporate Average Fuel Economy (CAFE) adjustment 'c' factor for the 1987 model year is 0.0050.

On July 1, 1985, EPA promulgated final rules which established CAFE adjustments for 1980 and later model year passenger automobiles (50 FR 27127). These adjustments were granted to compensate for the effects of past test procedure changes and, thus, maintain the stringencies of the CAFE standards at their established levels.

The adjustment equation incorporates a coefficient, the 'c' factor, which is specific to the model year. The final rule established 'c' factor values for the 1980 through 1985 model years. For 1986 and later model years, the rule stated that the Administrator will specify the 'c' values after the necessary laboratory humidity and test fuel data become available. The 1986 model year 'c' value was specified as 0.0022 in the EPA guidance letter CD-86-09 (LDV), dated May 21, 1986.

Based on 1986 calendar year EPA laboratory humidity and fuels data, the 'c' factor is 0.0050. This is the factor EPA will use in calculating final passenger automobile CAFE's for the 1987 model year. Manufacturers should also use this correction factor in calculating their 1987 model year passenger automobile CAFE prior to EPA submission. The enclosure presents the calculation of this factor. Any questions or comments regarding the CAFE adjustment coefficient should be directed to Mr. J. Whitehead, (313) 668-4205.

Sincerely,

Robert E. Maxwell, Director  
Certification Division

Office of Mobile Sources

Enclosure

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Enclosure to Manufacturer Letter CD-87-04 (LDV)

Calculation of the Passenger Vehicle CAFE  
Adjustment Coefficient for the 1987 Model Year

This enclosure presents the calculation of the passenger vehicle Corporate Average Fuel Economy (CAFE) adjustment coefficient for the 1987 model year. The methodology detailed in the Summary and Analysis of Comments (hereafter referred to as the S&A) for the July 1, 1985 CAFE adjusted rulemaking (50 FR 27127) is used to calculate the coefficient.

The CAFE adjusted coefficient for passenger vehicles is the "c" factor in §600.510-80(c). This factor is termed the "Combined Correction Coefficient" in the Calculations section of the S&A. The equation for the combined correction coefficient (see pg 122) is:

$$C = Ch + CF + Co + Cs \quad \text{Equation (1)}$$

where:

C = Combined Correction Coefficient  
Ch = Correction Coefficient for Humidity  
Cf = Correction Coefficient for Fuels  
Co = Correction Coefficient for Oils  
Cs = Correction Coefficient for Exhaust Samplers

For 1985 and later model years, the correction coefficients for energy efficient oils (Co) and exhaust samplers (Cs) are both zero. Therefore, equation (1) simplifies to:

$$C = Ch + Cf \quad \text{Equation (2)}$$

The Laboratory Humidity section of the S&A provides the necessary information to develop the following equation:

$$Ch = Sh (H75 - HMY) \quad \text{Equation (3)}$$

where:

Sh = Humidity Sensitivity Coefficient

$= -1.9 \times 10^{-4} / \text{grain H}_2\text{O}$  (for 1981 and later model years)  
 H75 = Average Humidity in the 1975 model year  
 $= 49 \text{ gr./lb.}$  (as measured by a wet bulb psychrometer)  
 HMY = Average Humidity for a Model Year.

Since the humidity sensitivity coefficient and the average humidity in the 1975 model year are known, only the average humidity for the 1986 model year needs to be determined to calculate the correction coefficient for humidity. The average humidity was established as the average humidity of the EPA laboratory over a calendar year. This average humidity level must, however, be increased by 5 gr. /lb. to make the current humidity measurements (which are taken with a dew point hygrometer) comparable with the 1975 model year measurements (which were taken with a wet bulb psychrometer).

Examination of EPA test data for the 1986 calendar year showed the average humidity level to be 50 gr./lb. as measured by dew point hygrometer. This corresponds to an equivalent wet bulb psychrometer humidity level of 55 gr. /lb. Using this data and equation (3), the correction coefficient for humidity was calculated to be 0.0011.

The Test Fuel Properties section of the S&A used an equation proposed by General Motors (GM) to calculate correction coefficients for fuels. Using this equation, the correction coefficient for fuels is:

$$C_f = ((CWF_t / CWF_r) \times (NHV_r / NHV_t) \times (R + (sgr \times NHV_r \times (1 - R)) / (sgr \times NHV_t)) - 1) - 1 \quad \text{Equation (4)}$$

where:

Subscript t = test conditions  
 Subscript r = reference conditions  
 CWF = Carbon Weight Fraction  
 NHV = Net Heating Value  
 sgr = Fuel Specific Gravity  
 R = Ratio of % change in fuel economy resulting from a given % change in volume-based heating value.  
 $= 0.6$

The following reference fuel property values were established:

sg, = 0 . 739  
NHV, = 18, 507 Btu/lb.  
CWF, = 0 . 866

Calculation of Cf also requires determining the average annual properties (sgt, CWft and NHVt) of the test fuel used at the EPA laboratory. For the 1986 calendar year, these properties were:

sgt = 0 . 743  
NHVt = 18,453 Btu/lb  
CWft = 0 . 866

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Using equation (4), the fixed values (reference fuel properties and the "R" factor) and the average annual EPA test fuel properties, the correction coefficient for fuels is 0.0039 for the 1987 model year.

Summing these "Ch" and "Cf" values (per equation 2) yields a "c" factor of 0.0050 for the 1987 model year. This value should be used for 1987 model year CAFE calculations.

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